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The Use Of Electrical Stimulation And Cryotherapy In Pain Reduction For A Patient Following An Arthroscopic Partial Meniscectomy: A Case Report

Miranda Carlson
University of New England

TITLE PAGE

The Use of Electrical Stimulation and Cryotherapy for Pain Reduction for a Patient Following a Arthroscopic Partial Meniscectomy: A Case Report.

M Carlson, BS, is a DPT student at the
University of New England, 716 Stevens Ave. Portland, ME 04103
Address all correspondence to Miranda Carlson at: mcarlson1@mail.une.edu

The patient signed an informed consent allowing the use of medical information and video footage for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

ABSTRACT

Background and Purpose

A partial meniscectomy consists of removing some meniscus from the knee. Pain management is utilized which may include Transcutaneous Electrical Nerve Stimulation (TENS) and cryotherapy. TENS has been shown to be more effective than pain medication and aid in faster regains of strength and range. Cryotherapy has been shown to have a significant effect on the level of pain and amount of pain medication consumption. The purpose of this case report is to describe the patient management and outcomes of a patient status-post partial medial meniscectomy treated with TENS and cryotherapy for pain management.

Case Description

The patient was a female status post partial medial meniscectomy who suffered a medial meniscal tear from a fall. Patient had 13 physical therapy sessions over four weeks. Therapy included cryotherapy and TENS to address pain followed by functional strengthening. Outcome measures: APTA OPTIMAL, KOOS Knee survey, Lower Extremity Functional Scale, Patient-Specific Functional Scale, and Timed 10-Meter Walk Test.

Outcomes

The patient reported 0/10 pain after two weeks of interventions. The patient's Lower Extremity Functional Scale improved from 22 to 73 and Patient Specific Functional Scale improved from 4 to 30. The KOOS, APTA OPTIMAL, and gait speed improved from impaired scores to unimpaired scores. At discharge, the patient had improved knee strength and range and decreased girth measurements.

Discussion

The patient made excellent progress during the 13 physical therapy treatment session and was satisfied to reach her goals of having no pain and being able to return to work at regular duty without any issues. Further research should be concluded to see the effects of multiple modalities for pain relief on other populations.

BACKGROUND AND PURPOSE

Pain is a common symptom following any surgical procedure. There have been many different studies about the modalities that can be utilized to decrease pain[1]. One of the more common modalities is transcutaneous electrical nerve stimulation (TENS). Jensen et al.[2] conducted a study focusing on the use of TENS with arthroscopic knee surgery to determine if it is effective as pain medication following the procedure. They compared three groups: patients with no TENS unit, patients with a "placebo" TENS unit, and patients with a "live" TENS unit. The results showed that the use of the "live" TENS unit was effective at decreasing postoperative pain in 93% of patients in that group. The amount of pain and medication required was also the least in the "live" TENS group. There were also results that showed that those in the "live" TENS group were able to regain strength and range one month sooner than the other two groups. The results of this study were effective in demonstrating the benefits of using TENS for pain management in a patient following an arthroscopic knee surgery.

Another common modality used for pain management is cryotherapy. A study was conducted by Lessard et al.[3] focusing on the efficacy of cryotherapy following arthroscopic knee surgery. The study looked at two groups of patients: cryotherapy in conjunction with exercises and just exercises alone. The McGill Pain Questionnaire was used to assess the quality and intensity of pain. Following a one week home program, the patients were re-evaluated. The authors found a statistically significant difference was found between the two groups in the affective portion of the McGill Pain Questionnaire. They also found a significant difference in the amount of medication consumption and weight-baring status. These results demonstrated that cryotherapy can be useful in pain management following an arthroscopic knee surgery.

Although there is viable evidence about the use of TENS and cryotherapy, there is little evidence to suggest the effectiveness of using the two modalities together and their possible pain relief outcomes. The purpose of this case report is to demonstrate the use of TENS and cryotherapy with the goal of minimizing pain prior to strengthening of a patient with a knee postoperative partial meniscectomy.

CASE DESCRIPTION

The patient for this case report was a 55 year old female who had been experiencing left knee pain for four weeks due to a fall. She presented to an urgent care facility two weeks after the incident because she was still experiencing knee pain. A magnetic resonance image was performed three weeks after the incident and showed a medial meniscal tear. The patient then met with an orthopedic surgeon and it was determined that an arthroscopic partial meniscectomy was the best plan of action. The procedure was performed four weeks after the initial incident and the patient was referred back to physical therapy (PT) one days post-op.

During the first PT visit, the patient described herself as a very healthy person with an active lifestyle, a physically demanding job, not taking any medications and does not smoke. Patient had an unremarkable family and medical history. This was her first surgery. The patient expressed that her goals for PT were to have no pain in her left knee and to return to work on regular duty as soon as possible. A systems review conducted at the initial examination revealed:

TABLE 1

Cardiovascular/Pulmonary

Impaired	**Edema present in the left knee**
Integumentary	
Impaired	**Incision on the inferior medial aspect of the patella on left knee, 2 cm long, covered with steri-strip**
	Incision on the inferior lateral aspect of the patella on left knee, 2 cm long, covered with steri-strip
	Incision on the superior medial aspect of the patella on left knee, 2 cm long, covered with steri-strip
Musculoskeletal	
Impaired	**Gross range of motion impairments of the left knee.**
	Gross strength impairments of left knee
Neuromuscular	
Impaired	**Transfers and transitions performed with moderate guarding of left LE**
	Gait with bilateral (B/L) axillary crutches, weight baring as tolerated (WBAT) on left lower extremity (LE)
Communication, Affect, Cognition, and Learning Style	
Not Impaired	

120

121 **CLINICAL IMPRESSION 1**

122 Patient presented status-post a left partial meniscectomy. Following a subjective history and
123 systems review, it was hypothesized that the patient will present with left knee strength and
124 range of motion deficits, an antalgic gait, pain, and swelling as well as decreased cadence and
125 increased difficulty with daily activities. Further tests and measures to confirm this hypothesis
126 include: anthropometric measurements, muscle performance, goniometric measurements, Gait
127 Speed, and a numeric pain scale.

This patient was a good candidate for a case report because she did not have any other comorbidities or health concerns that would affect her recovery process. Also, there is a paucity of information pertaining to the use of TENS and cryotherapy together to aid in pain relief during PT.

EXAMINATION – TESTS AND MEASURES

Following the attainment of a comprehensive patient history, a patient examination was performed in accordance with guidelines provided by the Guide to Physical Therapist Practice.

Knee girth was measured upon admission then weekly until discharge. Measurements were taken at the joint line, 3 inches above the joint line, 3 inches below the joint line, and 6 inches below the joint line while the patient was in supine. The same measurements were taken on the right knee for baseline comparison. As can be seen in Table 2, the left knee showed increased girth measurements when compared to the uninvolved right knee.

Muscle performance was measured in sitting with the feet unsupported. Patient was positioned with knee at 90 degrees and instructed to resist manual knee extension force preformed by the student physical therapist. Patient was then positioned in slightly less than full knee extension and instructed to resist manual knee flexion force performed by the student physical therapist. Strength measurements were based on the 0 to 5 grading scale within the available range of motion. The patient demonstrated decreased left knee flexion and extension strength at initial evaluation (see Table 2). Manual muscle testing has been shown to have convergent construct validity with a hand-held dynamometer when assessing muscle strength[4].

Active range of motion was measured in supine. At initial evaluation, left knee active range of motion was measured at 25-60 degrees of flexion (see Table 2). Research has shown that goniometric measurements at the knee are both reliable and valid[5].

Pain rating was taken at the beginning of each therapy session with the prompt "What would you rate your knee pain on a scale of 0-10, 0 being no pain and 10 being you need to go to the emergency room?" The patient was also encouraged to report any increased pain during any particular intervention.

To assess functional abilities of the patient, several functional outcome measures were used. All measures used were performed in accordance with the directions provided with each test. Each questionnaire was provided to the patient upon initial evaluation and discharge to complete.

The Lower Extremity Functional Scale (LEFS) is a self-report questionnaire containing 20 questions about a person's ability to perform everyday tasks. The responses are based on a 5-point ordinal scale, 0 being extreme difficulty or unable to perform activity, and 4 being no difficulty. The lower the score, the greater the disability. It has been determined that the minimal detectable change is 9 scale points. The test has been determined to have high reliability and validity[6]. At initial evaluation, the patient scored 22/80 on the LEFS, indicating high disability with functional tasks (see Table 2).

The Patient-Specific Functional Scale is a questionnaire used to quantify activity limitation and measure functional outcome. The patient was asked at the initial evaluation to identify three important activities that she was unable to do or had difficulty with as a result of the procedure.

She was then asked to rate each activity on a 0-10 scale, 0 being unable to perform activity, and 10 being able to perform activity at the same level as before injury. The patient scored a 4/30 upon admission, indicating high difficulty with the three chosen activities. This outcome measure has been shown to have excellent reliability and validity[7].

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a survey used to assess the patient's opinion about their knee and associated problems. There are five subscales: Symptoms/stiffness, Pain, Function in daily living, Function in sport and recreational activities, and Quality of Life. Each subscale has questions answered on a 5 point ordinal scale that is then presented as a percentage. The highest score for each subscale is 100%, indicating no issues with the involved knee. Refer to Appendix A to see the patient's initial KOOS survey. This outcome measure has been determined to have high validity and reliability[8].

The Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL) is a self-report questionnaire that measures difficulty and self-confidence in performing 21 movements that are needed in order to accomplish activities of daily living. Each question is answered on a 5 point ordinal scale. For this outcome measure, a higher score indicates more impairment. The patient scored 68/105 for difficulty and 71/105 for level of confidence, both high scores. Refer to Appendix B to see the patient's initial OPTIMAL survey. This outcome measure has been shown to have acceptable statistics for validity[9].

Gait speed was measured using the Timed 10-Meter Walk Test. At initial evaluation, the patient's 'comfortable pace' was measured at .66 m/s (Table 2), indicating a moderate fall risk.

The patient's 'as fast as you can safely walk' pace was measured at .93 m/s (Table 2), which is functional. This outcome measure has been found to have excellent reliability[10].

TABLE 2

EXAMINATION MEASURE			Admission	Discharge
Anthropometric measurement – edema (cm)				
Right knee		Left Knee		
3" above joint line	40.6	3" above joint line	43.8	40.6
joint line	38.7	joint line	41.3	38.7
3" below joint line	36.2	3" below joint line	38.7	36.2
6" below joint line	36.2	6" below joint line	36.2	36.2
Muscle performance				
Right knee		Left knee		
extension	5/5	Extension	3+/5	5/5
flexion	5/5	flexion	3+/5	5/5
Range of motion				
Right knee		Left knee		
extension	0 deg	Extension	-25 deg	0 deg
flexion	135 deg	Flexion	60 deg	125 deg
Pain				
		Left knee	4/10	0/10

Outcome measure	**Admission**	**Discharge**
SELF-CARE AND HOME MANAGEMENT		
LEFS	**22/80**	**73/80**
Patient-Specific Functional Scale	**4/30**	**30/30**
KOOS Knee Survey		
Symptoms/stiffness	**32.14%**	**75.00%**
Pain	**55.56%**	**88.89%**
Function, daily living	**54.41%**	**94.12%**
Function, sports and recreational activity	**25.00%**	**65.00%**
Quality of life	**50.00%**	**68.75%**
APTA OPTIMAL		
Difficulty	**68/105**	**31/105**
Confidence	**71/105**	**28/105**
GAIT, LOCOMOTION, AND BALANCE		
Timed 10-Meter Walk Test		
"comfortable pace"	**.66 m/s**	**1.13 m/s**
"as fast as you can safely walk:	**.93 m/s**	**1.35 m/s**

CLINICAL IMPRESSION 2

Based on the information gathered during the examination, it was determined that the initial clinical impression was correct. The patient presented with decreased strength and range of motion in the involved knee, reported pain and difficulty with daily activities, and demonstrated an antalgic gait. The examination did not yield any findings that would warrant a referral to a specialist or need for further testing. It was determined to be safe to continue with the plan of care and proceed with interventions. This data supported the belief that the patient was appropriate for the case. There were not any surprising or abnormal findings from the examination that could suggest infection or additional concerns that might affect rehabilitation. This allowed for minimal interference with the determination of whether the use of cryotherapy in conjunction with electrical stimulation for pain relief prior to functional interventions enabled the patient to return to prior level of function at a faster rate than with the use of a single pain management modality.

Diagnosis

The Physical Therapy Practice Pattern for this patient was 4I: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Bony or Soft Tissue Surgery.

Prognosis

The prognosis for this patient was excellent. She was an active individual, willing to participate in PT to make the healing process as smooth as possible. The patient was very forthcoming and specific about providing feedback about when she was experiencing pain and what provoked pain. Fabricant et al.[11] conducted a study looking at the factors that influence short term-recovery following a arthroscopic partial meniscectomy. Their research resulted in the knowledge age and depth of meniscal incision have no significant effect on recovery, however

the female gender was associated with a slower rate of recovery in the two to six weeks following surgery.

The plan for interventions to use with this patient was influenced by the protocol provided by the orthopedic surgeon (see Appendix C). Following these guidelines, it was decided to initially focus on regaining active range of motion, decreasing pain, and decreasing edema in the left knee.

Goals developed for the patient included:

- Short term goals: 1 week
    1. Patient will increase AROM knee flexion 5 deg.
    2. Patient will increase AROM knee extension 5 deg.
    3. Patient will report 3/10 pain at rest.
    4. Girth measurements will decrease .25 in.
- Long term goals: 6 weeks
    1. Patient will demonstrate non-antalgic gait without assistive device on indoor and outdoor surfaces.
    2. Patient will independently complete 12 steps with step through pattern.
    3. Patient will be independent with home exercise program.
    4. Patient will have functional AROM of left knee.
    5. Patient will report 0/10 pain at rest and during activities.
    6. Girth measurements of left knee will be equal to right knee.
    7. Patient will have 5/5 strength for knee flexion and extension.
    8. Patient will return to work on regular activity.

INTERVENTION

The patient received 13 1-hour PT sessions. She was scheduled for two to three sessions per week until the surgeon determined the patient demonstrated sufficient healing and the patient achieved her functional goals for physical therapy. The patient was compliant with all interventions used. She missed two sessions due to a pre-planned vacation in the third week of therapy, but was provided a home exercise program while she was away.

Coordination, Communication, Documentation

Communication with the referring physician was accomplished through brief meetings within the facility where both physical therapy and surgeon appointments would take place. The meetings would occur bi-weekly to ensure that the patient was healing and progressing in physical therapy accordingly. Each treatment session was documented using an electronic medical system, providing details and rationale about patient progression.

Patient/Client/Family – Related Instruction

Following the initial examination, the patient was educated about the diagnosis, prognosis, and plan of care. She was provided information about the post-operative protocol set forth by the surgeon. The patient was given an explanation of the different interventions listed in the protocol and how she would be progressed throughout the episode of care.

Procedural interventions

The procedural interventions were guided by the protocol provided by the surgeon. The focus throughout the entire plan of care was to decrease pain. In the beginning, this was coupled with increasing range of motion to a functional level. Once full range of motion was restored, the focus was pain control along with strengthening of the affected lower extremity. Strengthening was increased according to patient tolerance with a focus on making sure the patient did not

experience knee pain while attempting functional movements during ADLs and tasks required at work. The specific interventions can be seen in Appendix D.

Pain Management

Both TENS and cryotherapy were used for this patient. Four electrodes were placed on the anterior side of the left knee, surrounding the patella. The TENS unit was set at a high frequency (between 80-125 pulses per second) with a low pulse duration (50-125 microseconds). This allowed the stimulation to be comfortable and strong at the same time, but still low enough to avoid a muscle contraction[12]. For cryotherapy, two ice packs were places on the anterior and posterior aspect of the knee. The modalities were applied for fifteen minutes at the beginning of each session.

Stretching

Stretching was very important to help regain functional range of motion of the left knee. Initially, passive range of motion (PROM) was utilized to increase available flexion and extension of the knee. While the patient was supine, the physical therapist stretched the knee for a duration of ten minutes with 30 second holds in each direction to increase range of motion[13]. After the first week of therapy, the patient progressed to self-stretching with a strap so the patient could control the range. The patient performed hamstring stretching in supine and quadriceps stretching in side-lying, with instructions to hold for 30 seconds for ten repetitions.

Strengthening

Functional strengthening techniques were utilized to ensure that the patient would be able to safely return to the workplace and perform activities of daily life. Initially, the patient was instructed to complete concentric muscle contractions of the knee to aid in strengthening the muscles within the available range of motion. Quad sets and short-arc quad sets (SAQ)

performed in supine along with long-arc quad sets (LAQ) performed in sitting with feet unsupported were utilized to increase quadriceps strength. Heel slides were performed in supine to develop hamstring strength. After the first week, the patient was progressed to more functional activities that incorporated strengthening such as step-ups on a six-inch step, which mimicked ascending stairs, and squats, which serve a multitude of purposes in everyday life. The patient also progressed to performing strengthening exercises with resistance. Hip adductor and abductor exercises were incorporated to increase the stability of the entire lower extremity. The patient was instructed to perform hip adduction ball squeezes in hook-lying, during which she would squeeze a ball between her knees and maintain the contraction for five seconds. The patient also performed hip abduction exercises, initially with a green band, during which the patient was lying in supine and would use the uninvolved lower extremity as an anchor for the band as the left lower extremity performed abduction with a five second hold at end range. Terminal knee extension was performed in standing with a green band for resistance of the locking mechanism involved with end range extension and contraction of the vastus medialis oblique. End range extension is critical for a fluid, functional gait pattern. Single leg squat clocks were performed while standing on the affected lower extremity. The patient was instructed to tap each hour on half of a clock with the unaffected lower extremity while squatting on the involved side (See Figure 1). This exercise helped to increase stability of the involved leg, while also challenging balance.

FIGURE 1

All of the exercises were progressed as the patient reported less pain and increased during performance. To make squats more difficult, the patient was instructed to perform them on dynadiscs, which created an unstable surface. Exercises with bands were increased in repetitions or done with a band with higher resistance. As the patient demonstrated a more fluid gait pattern without reports of any pain, exercises were provided to challenge gait. The monster walk utilizes a band for resistance as the patient attempts to take steps with a wide stance (see Figure 2). The side lunges were done while maintaining a squat with erect posture. Both exercises served to strengthen the hip abductor musculature while challenging stability.

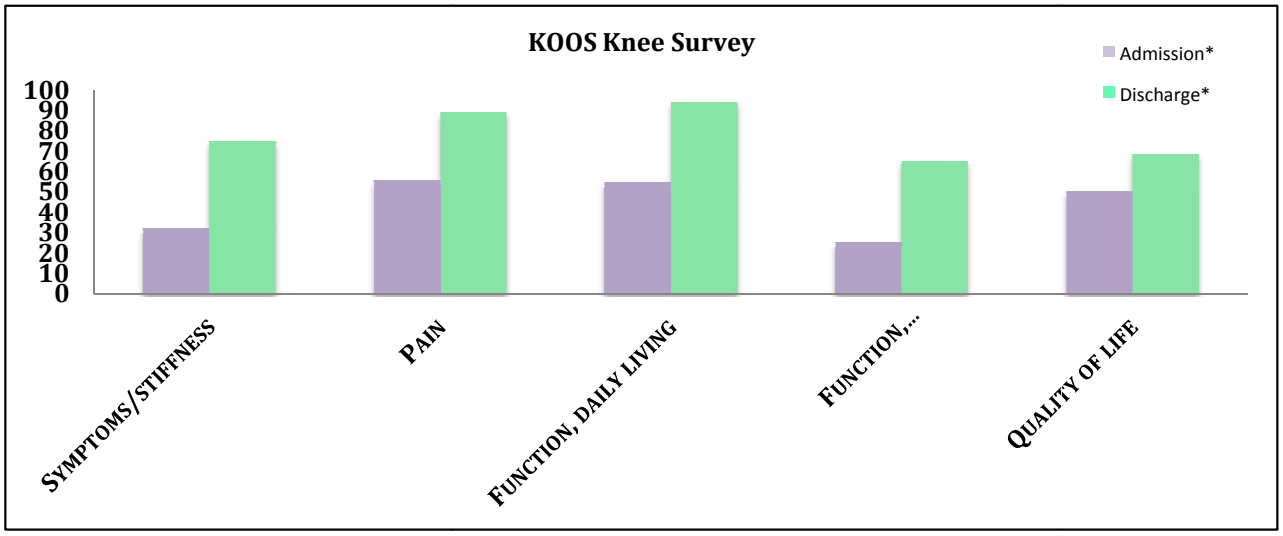
FIGURE 2

A lift assessment was performed prior to discharge to ensure that the patient would be able to function safely at work. The patient was required to lift ten to forty pounds at five pound intervals from the floor to her waist, demonstrating safe technique. The patient was also required to carry thirty pounds twenty-five feet. These activities mimicked those she would be performing at work and were incorporated into functional activities throughout the day. Functional strength training post-meniscectomy has been shown to result in improved functional performance and strength[14].

OUTCOMES

Following the interventions, the patient demonstrated significant improvements in active range of motion, strength, reported pain level, edema measurements, and the five functional outcome measures that were completed upon initial evaluation (refer to Table 2). Throughout the plan of care, the patient met all PT goals. The patient's active range of motion, strength, and girth measurements of the left knee were all equal to those of the right knee upon discharge evaluation. The patient reported 0/10 pain after two weeks of interventions. The patient scored 73/80 on the LEFS low disability with functional tasks. The patient scored 30/30 on the Patient-Specific Functional Scale, demonstrating the ability to perform all the activities on the test at a level equal to that prior to surgery. The outcomes of the KOOS survey can be seen in Figure 4, demonstrating a significant increase in all the sub-sections incorporated in the test. On the OPTIMAL, the patients scores significantly decreased, with a 31/105 for the difficulty section and a 28/105 on the confidence section (Appendix B). Upon discharge, the patient's gait speed measurements greatly increased. The patient performed a comfortable pace gait at 1.13 m/s and a "as fast as you can safely walk" gait at 1.35 m/s, both of which indicate that the patient is no longer at risk for a fall.

FIGURE 4



DISCUSSION

Pain can be a debilitating factor of life following any surgical procedure. One of the main focuses of any rehabilitation plan of care is pain management to ensure that a patient can maintain a quality of life that they deem desirable. A majority of the literature on postoperative pain describes the use of different modalities and pain relief techniques that can be used throughout rehabilitation. TENS and cryotherapy both have substantial literature supporting their role in pain relief following surgery. However, there is a paucity of information about the use of the two modalities in conjunction with one another and their overall effect on pain relief. This case report describes the evaluation, intervention, and outcomes of a patient following an arthroscopic partial meniscectomy who responded favorably to the pain management techniques used.

The patient was treated with TENS and cryotherapy to reduce knee pain prior to functional exercise. Pain was constantly monitored throughout each session, noting any increases in pain throughout different exercises. After two weeks of intervention, the patient reported no pain during any movement of the knee or functional activity. With the absence of pain, the focus of PT was able to transition to functional strengthening at a greater intensity in order to aid the patient in returning to work at regular duty without any physical restrictions.

With the abundance of surgical procedures performed every day, it would be helpful to explore the effects of multiple modalities for pain relief on other populations. It would also be interesting to look into the effects of modalities other than TENS and cryotherapy and their overall role in pain relief for patients. Further clinical trials should consider whether the implementation of multiple modalities may be an effective method for pain relief post surgery.

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Appendix A

KOOS initial

Symptoms - These questions should be answered thinking of your knee symptoms during the **last week.**

	Never	Rarely	Sometimes	Often	Always
S1. Do you have swelling in your knee?	○	○	○	○	◉
S2. Do you feel grinding, hear clicking or any other type of noise when your knee moves?	○	◉	○	○	○
S3. Does your knee catch or hang up when moving?	○	○	◉	○	○
S4. Can you straighten your knee fully?	◉	○	○	○	○
S5. Can you bend your knee fully?	◉	○	○	○	○

Stiffness - The following questions concern the amount of joint stiffness you have experienced during the **last week** in your knee. Stiffness is a sensation of restriction or slowness in the ease with which you move your knee joint.

	None	Mild	Moderate	Severe	Extreme
S6. How severe is your knee joint stiffness after first wakening in the morning?	○	○	◉	○	○
S7. How severe is your knee stiffness after sitting, lying or resting **later in the day?**	○	○	◉	○	○

Subtotal: 32.14%

Pain

	Never	Monthly	Weekly	Daily	Always
P1. How often do you experience knee pain?	○	○	○	◉	○

What amount of knee pain have you experienced the **last week** during the following activities?

	None	Mild	Moderate	Severe	Extreme
P2. Twisting/pivoting on your knee	○	○	○	◉	○
P3. Straightening knee fully	○	○	◉	○	○
P4. Bending knee fully	○	○	◉	○	○
P5. Walking on flat surface	○	◉	○	○	○
P6. Going up or down stairs	○	○	◉	○	○
P7. At night while in bed	○	◉	○	○	○
P8. Sitting or lying	○	◉	○	○	○
P9. Standing upright	○	◉	○	○	○

Subtotal: 55.56%

Function, daily living - The following questions concern your physical function. By this we mean your ability to move around and to look after yourself. For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee.

A1. Descending stairs				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A2. Ascending stairs				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme

For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee.

A3. Rising from sitting				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A4. Standing				
○ None	◉ Mild	○ Moderate	○ Severe	○ Extreme
A5. Bending to floor/pick up an object				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A6. Walking on flat surface				
○ None	◉ Mild	○ Moderate	○ Severe	○ Extreme
A7. Getting in/out of car				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A8. Going shopping				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A9. Putting on socks/stockings				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A10. Rising from bed				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A11. Taking off socks/stockings				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A12. Lying in bed (turning over, maintaining knee position)				
○ None	◉ Mild	○ Moderate	○ Severe	○ Extreme
A13. Getting in/out of bath				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme
A14. Sitting				
○ None	◉ Mild	○ Moderate	○ Severe	○ Extreme
A15. Getting on/off toilet				
○ None	○ Mild	◉ Moderate	○ Severe	○ Extreme

For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee

A16. Heavy domestic duties (moving heavy boxes, scrubbing floors, etc)				
○ Never	○ Rarely	○ Sometimes	◉ Often	○ Always
A17. Light domestic duties (cooking, dusting, etc)				
○ Never	○ Rarely	◉ Sometimes	○ Often	○ Always

Subtotal: 54.41%

Function, sports and recreational activities - The following questions concern your physical function when being active on a higher level. The questions should be answered thinking of what degree of difficulty you have experienced during the **last week** due to your knee.

SP1. Squatting				
○ None	○ Mild	○ Moderate	◉ Severe	○ Extreme
SP2. Running				
○ None	○ Mild	○ Moderate	◉ Severe	○ Extreme
SP3. Jumping				
○ None	○ Mild	○ Moderate	◉ Severe	○ Extreme
SP4. Twisting/pivoting on your injured knee				
○ None	○ Mild	○ Moderate	◉ Severe	○ Extreme
SP5. Kneeling				
○ None	○ Mild	○ Moderate	◉ Severe	○ Extreme

Subtotal: 25.00%

Quality of Life

Q1. How often are you aware of your knee problem?				
○ Never	○ Monthly	○ Weekly	◉ Daily	○ Constantly
Q2. Have you modified your life style to avoid potentially damaging activities to your knee?				
○ Not at all	○ Mildly	◉ Moderately	○ Severely	○ Totally
Q3. How much are you troubled with lack of confidence in your knee?				
○ Not at all	◉ Mildly	○ Moderately	○ Severely	○ Extremely
Q4. In general, how much difficulty do you have with your knee?				
○ None	○ Mild	◉ Moderately	○ Severe	○ Extreme

Subtotal: 50.00%

KOOS discharge

Symptoms - These questions should be answered thinking of your knee symptoms during the **last week.**

	Never	Rarely	Sometimes	Often	Always
S1. Do you have swelling in your knee?	○	○	◉	○	○
S2. Do you feel grinding, hear clicking or any other type of noise when your knee moves?	◉	○	○	○	○
S3. Does your knee catch or hang up when moving?	◉	○	○	○	○
S4. Can you straighten your knee fully?	○	○	○	◉	○
S5. Can you bend your knee fully?	○	○	◉	○	○

Stiffness - The following questions concern the amount of joint stiffness you have experienced during the **last week** in your knee. Stiffness is a sensation of restriction or slowness in the ease with which you move your knee joint.

	None	Mild	Moderate	Severe	Extreme
S6. How severe is your knee joint stiffness after first wakening in the morning?	○	◉	○	○	○
S7. How severe is your knee stiffness after sitting, lying or resting **later in the day?**	○	◉	○	○	○

Subtotal: 75.00%

Pain

	Never	Monthly	Weekly	Daily	Always
P1. How often do you experience knee pain?	◉	○	○	○	○

What amount of knee pain have you experienced the **last week** during the following activities?

	None	Mild	Moderate	Severe	Extreme
P2. Twisting/pivoting on your knee	○	◉	○	○	○
P3. Straightening knee fully	○	◉	○	○	○
P4. Bending knee fully	○	○	◉	○	○
P5. Walking on flat surface	◉	○	○	○	○
P6. Going up or down stairs	◉	○	○	○	○
P7. At night while in bed	◉	○	○	○	○
P8. Sitting or lying	◉	○	○	○	○
P9. Standing upright	◉	○	○	○	○

Subtotal: 88.89%

Function, daily living - The following questions concern your physical function. By this we mean your ability to move around and to look after yourself. For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee.

	None	Mild	Moderate	Severe	Extreme
A1. Descending stairs	◉	○	○	○	○
A2. Ascending stairs	◉	○	○	○	○

For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee.

	None	Mild	Moderate	Severe	Extreme
A3. Rising from sitting	◉	○	○	○	○
A4. Standing	◉	○	○	○	○
A5. Bending to floor/pick up an object	○	◉	○	○	○
A6. Walking on flat surface	◉	○	○	○	○
A7. Getting in/out of car	◉	○	○	○	○
A8. Going shopping	◉	○	○	○	○
A9. Putting on socks/stockings	○	◉	○	○	○
A10. Rising from bed	◉	○	○	○	○
A11. Taking off socks/stockings	○	◉	○	○	○
A12. Lying in bed (turning over, maintaining knee position)	◉	○	○	○	○
A13. Getting in/out of bath	◉	○	○	○	○
A14. Sitting	◉	○	○	○	○
A15. Getting on/off toilet	◉	○	○	○	○

For each of the following activities please indicate the degree of difficulty you have experienced in the **last week** due to your knee

	Never	Rarely	Sometimes	Often	Always
A16. Heavy domestic duties (moving heavy boxes, scrubbing floors, etc)	○	◉	○	○	○
A17. Light domestic duties (cooking, dusting, etc)	◉	○	○	○	○

Subtotal: 94.12%

Function, sports and recreational activities - The following questions concern your physical function when being active on a higher level. The questions should be answered thinking of what degree of difficulty you have experienced during the **last week** due to your knee.

	None	Mild	Moderate	Severe	Extreme
SP1. Squatting	○	○	◉	○	○
SP2. Running	○	◉	○	○	○
SP3. Jumping	○	◉	○	○	○
SP4. Twisting/pivoting on your injured knee	○	◉	○	○	○
SP5. Kneeling	○	○	◉	○	○

Subtotal: 65.00%

Quality of Life

	Never	Monthly	Weekly	Daily	Constantly
Q1. How often are you aware of your knee problem?	○	○	○	◉	○

	Not at all	Mildly	Moderately	Severely	Totally
Q2. Have you modified your life style to avoid potentially damaging activities to your knee?	○	◉	○	○	○

	Not at all	Mildly	Moderately	Severely	Extremely
Q3. How much are you troubled with lack of confidence in your knee?	◉	○	○	○	○

	None	Mild	Moderately	Severe	Extreme
Q4. In general, how much difficulty do you have with your knee?	○	◉	○	○	○

Subtotal: 68.75%

Appendix B

APTA OPTIMAL initial

APTA

OPTIMAL INSTRUMENT

Name:_____ DOB: ___/___/___) Date: ___/___/___

mm dd yyyy

Difficulty [ ] Baseline [ ] Follow up

Instructions: Please check the level of difficulty you have for each activity today.	Able to do without any difficulty	Able to do with little difficulty	Able to do with moderate difficulty	Able to do with much difficulty	Unable to do	Not applicable
1. Lying flat	1○	2◉	3○	4○	5○	9○
2. Rolling over	1○	2◉	3○	4○	5○	9○
3. Moving—lying to sitting	1○	2○	3◉	4○	5○	9○
4. Sitting	1○	2◉	3○	4○	5○	9○
5. Squatting	1○	2○	3○	4○	5◉	9○
6. Bending/stooping	1○	2◉	3○	4○	5○	9○
7. Balancing	1○	2◉	3○	4○	5○	9○
8. Kneeling	1○	2○	3○	4○	5◉	9○
9. Walking—short distance	1○	2○	3◉	4○	5○	9○
10. Walking—long distance	1○	2○	3○	4○	5◉	9○
11. Walking—outdoors	1○	2○	3◉	4○	5○	9○
12. Climbing stairs	1○	2○	3◉	4○	5○	9○
13. Hopping	1○	2○	3○	4○	5◉	9○
14. Jumping	1○	2○	3○	4○	5◉	9○
15. Running	1○	2○	3○	4○	5◉	9○
16. Pushing	1○	2○	3○	4◉	5○	9○
17. Pulling	1○	2○	3○	4◉	5○	9○
18. Reaching	1◉	2○	3○	4○	5○	9○
19. Grasping	1◉	2○	3○	4○	5○	9○
20. Lifting	1○	2○	3◉	4○	5○	9○
21. Carrying	1○	2○	3◉	4○	5○	9○

22. Thinking about *all* of the activities you would like to do, please mark an "x" at the point on the line that best describes your *overall* level of difficulty with these activities today.

I have extreme difficulty doing any of the activities that I would like to do.

I have no difficulty doing any of the activities that I would like to do.

23. From the above list, choose the 3 activities you would most like to be able to do without any difficulty (for example, if you would most like to be able to climb stairs, kneel and hop without difficulty, you would choose: 1. 12 2. 8 3. 13)

1. 13 2. 8 3. 5

_____ ___/___/___

Patient Signature MM / DD / YYYY

Adapted/revised in July 2005 and August 2006 with permission of APTA from Gozzolino AA, Mielenz TJ, De Vellis, RF, et al. Development and testing of a self-report instrument to measure actions: Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL). *Phys Ther.* 2008;88:515-530.

APTA

OPTIMAL INSTRUMENT

Name: _____ DOB: ___/___/___) Date: ___/___/___
(mm dd yyyy) (mm dd yyyy)

Confidence [ ] Baseline [ ] Follow up

Instructions: Please check the level of confidence you have for doing each activity today.	Fully confident in my ability to perform	Very confident	Moderate confidence	Some confidence	Not confident in my ability to perform	Not applicable
1. Lying flat	1○	2◉	3○	4○	5○	9○
2. Rolling over	1○	2◉	3○	4○	5○	9○
3. Moving-lying to sitting	1○	2◉	3○	4○	5○	9○
4. Sitting	1○	2◉	3○	4○	5○	9○
5. Squatting	1○	2○	3○	4○	5◉	9○
6. Bending/stooping	1○	2◉	3○	4○	5○	9○
7. Balancing	1○	2○	3◉	4○	5○	9○
8. Kneeling	1○	2○	3○	4○	5◉	9○
9. Walking-short distance	1○	2○	3○	4◉	5○	9○
10. Walking-long distance	1○	2○	3○	4○	5◉	9○
11. Walking—outdoors	1○	2○	3○	4◉	5○	9○
12. Climbing stairs	1○	2○	3○	4◉	5○	9○
13. Hopping	1○	2○	3○	4○	5◉	9○
14. Jumping	1○	2○	3○	4○	5◉	9○
15. Running	1○	2○	3○	4○	5◉	9○
16. Pushing	1○	2○	3○	4◉	5○	9○
17. Pulling	1○	2○	3○	4◉	5○	9○
18. Reaching	1◉	2○	3○	4○	5○	9○
19. Grasping	1◉	2○	3○	4○	5○	9○
20. Lifting	1○	2○	3◉	4○	5○	9○
21. Carrying	1○	2○	3◉	4○	5○	9○

22. Thinking about *all* of the activities you would like to do, please mark an "x" at the point on the line that best describes your *overall* level of confidence in performing these activities today.

I have *no confidence* that I can do activities that I would want to do.

I have *complete confidence* that I can do activities that I would want to do.

_____ ___/___/___

Patient Signature MM / DD / YYYY

Adapted/revised in July 2005 and August 2006 with permission of APTA from Guccione AA, Mielenz TJ, De Vellis, RF, et al. Development and testing of a self-report instrument to measure patient [illegible] Physical Therapy Improvement in Movement Assessment Log (OPTIMAL). [illegible]

APTA OPTIMAL discharge

APTA

OPTIMAL INSTRUMENT

Name:_____ DOB: ___/___/____) Date: ___/___/____
mm dd yyyy mm dd yyyy

Difficulty [ ] Baseline [ ] Follow up

Instructions: Please check the level of difficulty you have for each activity today.	Able to do without any difficulty	Able to do with little difficulty	Able to do with moderate difficulty	Able to do with much difficulty	Unable to do	Not applicable
1. Lying flat	1◉	2○	3○	4○	5○	9○
2. Rolling over	1◉	2○	3○	4○	5○	9○
3. Moving—lying to sitting	1◉	2○	3○	4○	5○	9○
4. Sitting	1◉	2○	3○	4○	5○	9○
5. Squatting	1○	2◉	3○	4○	5○	9○
6. Bending/stooping	1○	2◉	3○	4○	5○	9○
7. Balancing	1◉	2○	3○	4○	5○	9○
8. Kneeling	1○	2○	3◉	4○	5○	9○
9. Walking—short distance	1◉	2○	3○	4○	5○	9○
10. Walking—long distance	1◉	2○	3○	4○	5○	9○
11. Walking—outdoors	1◉	2○	3○	4○	5○	9○
12. Climbing stairs	1◉	2○	3○	4○	5○	9○
13. Hopping	1○	2◉	3○	4○	5○	9○
14. Jumping	1○	2◉	3○	4○	5○	9○
15. Running	1○	2○	3◉	4○	5○	9○
16. Pushing	1○	2◉	3○	4○	5○	9○
17. Pulling	1○	2◉	3○	4○	5○	9○
18. Reaching	1◉	2○	3○	4○	5○	9○
19. Grasping	1◉	2○	3○	4○	5○	9○
20. Lifting	1◉	2○	3○	4○	5○	9○
21. Carrying	1◉	2○	3○	4○	5○	9○

22. Thinking about *all* of the activities you would like to do, please mark an "x" at the point on the line that best describes your *overall* level of difficulty with these activities today.

I have *extreme difficulty* doing any of the activities that I would like to do.

I have *no difficulty* doing any of the activities that I would like to do.

23. From the above list, choose the 3 activities you would most like to be able to do without any difficulty (for example, if you would most like to be able to climb stairs, kneel and hop without difficulty, you would choose: 1. 12 2. 8 3. 13)

1. 8 2. 5 3. 6

_____ ___/___/____
Patient Signature MM / DD / YYYY

APTA

OPTIMAL INSTRUMENT

Name:_____ **DOB:** ___/___/____ (mm dd yyyy) **Date:** ___/___/____ (mm dd yyyy)

Confidence [ ] Baseline [ ] Follow up

Instructions: Please check the level of confidence you have for doing each activity today.	Fully confident in my ability to perform	Very confident	Moderate confidence	Some confidence	Not confident in my ability to perform	Not applicable
1. Lying flat	1◉	2○	3○	4○	5○	9○
2. Rolling over	1◉	2○	3○	4○	5○	9○
3. Moving-lying to sitting	1◉	2○	3○	4○	5○	9○
4. Sitting	1◉	2○	3○	4○	5○	9○
5. Squatting	1◉	2○	3○	4○	5○	9○
6. Bending/stooping	1◉	2○	3○	4○	5○	9○
7. Balancing	1◉	2○	3○	4○	5○	9○
8. Kneeling	1○	2◉	3○	4○	5○	9○
9. Walking-short distance	1◉	2○	3○	4○	5○	9○
10. Walking-long distance	1◉	2○	3○	4○	5○	9○
11. Walking—outdoors	1◉	2○	3○	4○	5○	9○
12. Climbing stairs	1◉	2○	3○	4○	5○	9○
13. Hopping	1○	2◉	3○	4○	5○	9○
14. Jumping	1○	2◉	3○	4○	5○	9○
15. Running	1○	2○	3◉	4○	5○	9○
16. Pushing	1○	2◉	3○	4○	5○	9○
17. Pulling	1○	2◉	3○	4○	5○	9○
18. Reaching	1◉	2○	3○	4○	5○	9○
19. Grasping	1◉	2○	3○	4○	5○	9○
20. Lifting	1◉	2○	3○	4○	5○	9○
21. Carrying	1◉	2○	3○	4○	5○	9○

22. Thinking about *all* of the activities you would like to do, please mark an "x" at the point on the line that best describes your *overall* level of confidence in performing these activities today.

I have *no confidence* that I can do activities that I would want to do.

I have *complete confidence* that I can do activities that I would want to do.

_____ Patient Signature

___/___/____ MM / DD / YYYY

Appendix C

Meniscectomy & Debridement
Post-Operative Protocol

Phase I – Maximum Protection (Week 0 to 1):

- Ice and modalities as needed to reduce pain and inflammation
- Use crutches for 2 to 5 days to help reduce swelling, the patient may discontinue crutches when able to walk without a limp or pain
- Elevate the knee above the heart for the first three to five days
- Initiate patella mobility drills
- Full active/passive knee range of motion exercises
- Quadriceps setting focusing on VMO function
- Multi-plane open kinetic chain straight leg raising
- Gait training
- Stationary bike as swelling and pain allow

Phase II – Progressive Stretching and Early Strengthening Phase (Weeks 1 to 4):

- Patella mobility and scar massage
- Active and static lower extremity stretching
- Treadmill and/or elliptical trainer as strength and swelling allow, avoid impact activities
- Bilateral closed kinetic chain strengthening progressing to unilateral as tolerated
- Implement reintegration exercises emphasizing core stability exercises
- Closed kinetic chain multi-plane hip exercises
- Proprioception drills emphasizing neuromuscular control

Phase III – Advanced Strengthening and Proprioception Phase (Weeks 4 to 6):

- Advance time and intensity on cardiovascular program-no running
- Functional cord resistance program
- Gym program
- Pool running program progressing to dry land as tolerated

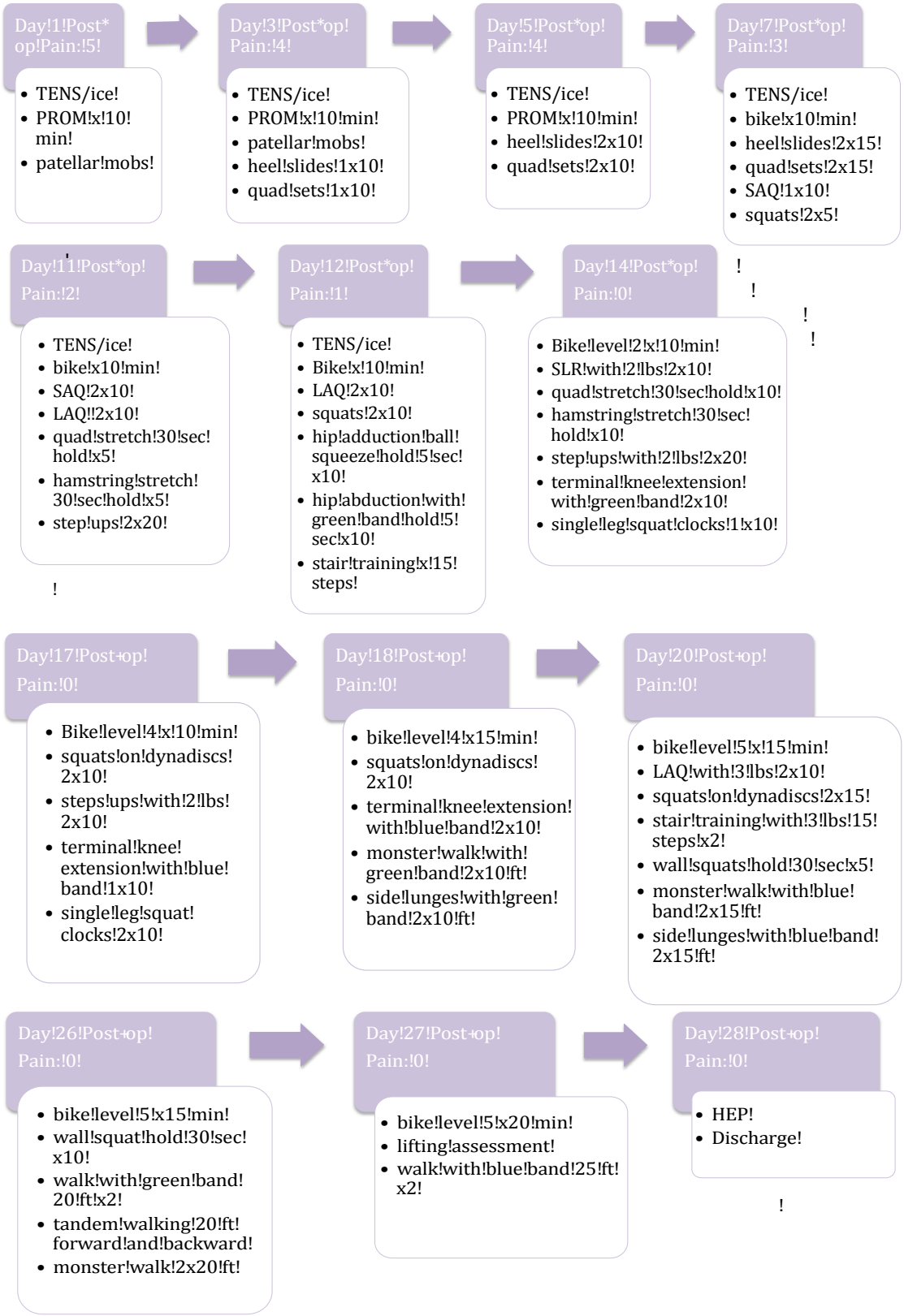
Phase IV – Advanced Strengthening Phase (Weeks 6 to 8):

- Running and agility program
- Controlled field drills
- Advance gym program
- Plyometric exercises

Phase V – Return to Sports Phase (8-12 weeks):

- Progress sport specific multi-directional drills
- > 90% on Sports test and negative clinical exam for return to full activity

Appendix D


Day!1!Post*op!Pain:!5!
• TENS/ice!
• PROM!x!10!min!
• patellar!mobs!
Day!3!Post*op!Pain:!4!
• TENS/ice!
• PROM!x!10!min!
• patellar!mobs!
• heel!slides!1x10!
• quad!sets!1x10!
Day!5!Post*op!Pain:!4!
• TENS/ice!
• PROM!x!10!min!
• heel!slides!2x10!
• quad!sets!2x10!
Day!7!Post*op!Pain:!3!
• TENS/ice!
• bike!x10!min!
• heel!slides!2x15!
• quad!sets!2x15!
• SAQ!1x10!
• squats!2x5!
Day!11!Post*op!Pain:!2!
• TENS/ice!
• bike!x10!min!
• SAQ!2x10!
• LAQ!!2x10!
• quad!stretch!30!sec!hold!x5!
• hamstring!stretch!30!sec!hold!x5!
• step!ups!2x20!
Day!12!Post*op!Pain:!1!
• TENS/ice!
• Bike!x!10!min!
• LAQ!2x10!
• squats!2x10!
• hip!adduction!ball!squeeze!hold!5!sec!x10!
• hip!abduction!with!green!band!hold!5!sec!x10!
• stair!training!x!15!steps!
Day!14!Post*op!Pain:!0!
• Bike!level!2!x!10!min!
• SLR!with!2!lbs!2x10!
• quad!stretch!30!sec!hold!x10!
• hamstring!stretch!30!sec!hold!x10!
• step!ups!with!2!lbs!2x20!
• terminal!knee!extension!with!green!band!2x10!
• single!leg!squat!clocks!1!x10!
Day!17!Post+op!Pain:!0!
• Bike!level!4!x!10!min!
• squats!on!dynadiscs!2x10!
• steps!ups!with!2!lbs!2x10!
• terminal!knee!extension!with!blue!band!1x10!
• single!leg!squat!clocks!2x10!
Day!18!Post+op!Pain:!0!
• bike!level!4!x15!min!
• squats!on!dynadiscs!2x10!
• terminal!knee!extension!with!blue!band!2x10!
• monster!walk!with!green!band!2x10!ft!
• side!lunges!with!green!band!2x10!ft!
Day!20!Post+op!Pain:!0!
• bike!level!5!x!15!min!
• LAQ!with!3!lbs!2x10!
• squats!on!dynadiscs!2x15!
• stair!training!with!3!lbs!15!steps!x2!
• wall!squats!hold!30!sec!x5!
• monster!walk!with!blue!band!2x15!ft!
• side!lunges!with!blue!band!2x15!ft!
Day!26!Post+op!Pain:!0!
• bike!level!5!x15!min!
• wall!squat!hold!30!sec!x10!
• walk!with!green!band!20!ft!x2!
• tandem!walking!20!ft!forward!and!backward!
• monster!walk!2x20!ft!
Day!27!Post+op!Pain:!0!
• bike!level!5!x20!min!
• lifting!assessment!
• walk!with!blue!band!25!ft!x2!
Day!28!Post+op!Pain:!0!
• HEP!
• Discharge!